IN THE SPECIFICATION

In the specification please substitute the following numbered paragraphs for the same numbered paragraphs:

[0029] FIG. 9 is a side view in perspective of a drum shredder with a discharge assembly in accordance with the present invention.

FIG. 10 is a perspective view of a drum shredder with a discharge assembly in accordance with an embodiment of the present invention showing a cutting drum in phantom.

[0041] Referring now to FIGS. 3a and 3b, therein is generally depicted therein at 100a variable torque shredder for reducing wood in accordance with a preferred embodiment of the present invention. As shown, the tapered cutting drum has a cross-section with an outer diameter that is smaller than an outer diameter of another cross-section of said drum. FIG. 3a is a partial top view and FIG. 3b is a partial cross-sectional side view. The shredder 100 has a housing 102, a drive 122, and a tapered cutting drum 114 supported in the housing and connected to the drive 122. At least one of cutting blade 116 is disposed about an outer surface of the cutting drum 114. The shredder 100 also has an anvil 112, which preferably cooperates with the cutting drum 114 to form an acute cutting angle. An acute cutting angle provides means for capturing and pulling material into the cutting blade(s).

[0051] In a preferred embodiment of the cutting implements, as shown in FIGS. 6 and 8, the cutting blade(s) ~~508, 510, 512~~ is (are) a long knife(s) or chisel(s) that extends longitudinally along the cutting axis of the cutting drum (not numbered in Fig.6, elements 508, 510 and 512 of Fig. 8). Each knife may be connected to the cutting drum at an acute angel relative to the surface thereof to enhance chipping and material draw into the shredder, Preferably each cutting blade extends at least 50% of the length of the cutting zone, more preferably extends at least 90%, and most preferably extends substantially the entire length of the cutting zone, e.g. the exposed cutting region or section of a cone or cutting plane, i.e. plus or minus a few inches.

[0055] Referring now to FIG. 6, depicted therein at 150 is a most preferred embodiment of a drum shredder, the shredder 150 having multiple cutting cones mounted co-axial and nose-to-nose. As shown, the tapered cutting drum has a cross-section 151 with an outer diameter that is smaller than an outer diameter 153 of another cross-section of said drum. The shredder 150 includes at least one anvil, two rotatable cutting cones 152, 154 mounted to at least one drive, the cutting cones cooperating with the anvil to provide compound cutting angles. Preferably the anvil is mounted at or below the axis of rotation to provide an acute cutting angle. As shown, the cutting cones may be separated by a spacer 155, such as a short drive shaft or rod. Each cutting cone 150, 152 has at least one cutting blade disposed along an outer surface of the cutting cone, but may alternatively have two, three or more cutting blades each. By adding more cutting blades, the rate at which material is drawn into the shredder can be increased. Each cutting blade preferably extends

substantially the length of each respective cutting region or cone. The blades on each cutting cone may be mounted on the same cutting plane as the adjoining cutting cone (as shown in FIG. 6) or the blades may be staggered as shown in FIG. 8.

[0057] The drum shredder 500 has a plurality of cutting zones or regions with varying distances from the input. As shown, the tapered cutting drum has a cross-section 503 with an outer diameter that is smaller than an outer diameter 501 of another cross-section of said drum. A first cutting zone has a speed faster than a second cutting zone. The second zone has a higher torque than the first zone. The first zone angles inward toward the second zone in the direction of material feed. For example, as two cutting cones meet nose to nose, material will typically contact the outer regions of the cones first, as they have a greater radius and are positioned closer to the shredder input. As material is shredded, it is pulled inward by the action of the cutting blades and the angle of the cutting cone surface to a second cutting region of higher torque. The nose-to-nose arrangement thereby provides enhanced draw and improved cutting.

[0059] Referring now to FIG. 9, depicted therein at 400 is a discharge assembly for allowing chipped material to be effectively dispelled from the shredder into an awaiting vehicle or onto the ground substantially clear of the unit. The discharge assembly 400 includes a bellyband 410 which forms a space that is in communication with the chipping zone 412 or material/blade contact plane; a transition 414 in communication with the bellyband 410; and a discharge port ~~416~~ in communication with the transition 414. As shown in Fig. 10, the drum shredder 600 may include a cutting drum 603 rotatably mounted in a housing 601. As shown, the drum shredder 600 has a transition 604 and a discharge port 602 for discharging chipped material. If the shredder has a bellyband that partially wraps the cutting drum, the bellyband would open into the transition which in turn may open into the discharge port to form the discharge assembly.

[0060] The bellyband 410 is a housing that follows the surface of the cutting drum 418 to guide reduced material to the transition 414. The bellyband 410 preferably begins adjacent to the anvil 420 and follows an arc A around the cutting drum 418. The arc A is ~~defined as beginning where chipping takes place (the material/blade contact plane)~~ measured from a line beginning parallel to the infeed at a height of the center of the drum, which is defined as 0 degrees. The point or plane of the arc A directly opposite ~~the cutting point~~ this line is then defined herein as 180 degrees. The bellyband provides a space between the bellyband and the cutting drum for chips to travel in. The bellyband may have a front wall and a set of sidewalls. The bellyband preferably conforms with the shape of the cutting drum. In a preferred embodiment hereof, where the cutting drum is tapered, the bellyband is formed with a multi-sided, and/or multi angled front wall 422 that conforms to the angle of the tapered drum. For example, if the drum is `bow tie` shaped in cross-section, or tapered toward a middle section, the bellyband will have a wall with surface having a `v-shaped` cross-section. The space between the bellyband and the cutting drum is preferably uniform or substantially uniform along the length and width of the bellyband. The clearance of the bellyband from the cutting implements is preferably 1/8th of an inch or less and more preferably {fraction (1/16)}th of an inch or less. The bellyband preferably extends along less than 180 degrees, more preferably extends along less than 135 degrees, more

preferably extends along less than the 120 degrees and more preferably less than 95 degrees of the arc A. The bellyband preferably extends along at least 90 degrees of the arc A. In relative terms, the bellyband preferably extends to the point (or plane) of the arc that includes the lowest point of the cutting drum, but is preferably less than 10 degrees past this point. The bellyband 410 terminates at the transition 414.

[0061] The transition 414 is ~~an enclosed~~ a housing that allows chips to be guided away and upward from the cutting drum and/or the bellyband to be discharged from the machine. The transition begins at a point where the distance from the cutting drum increases (over that of the bellyband, which is substantially uniform). The transition 414 ultimately tapers along a length to a discharge port (not shown), which may be circular, ovular, square or rectangular. The transition 414 may be attached to the bellyband 410 or any other suitable structure, such as the housing. The transition 414 preferably guides the direction of chips beginning as close to the bottom, most point of the arc of the chipper housing or at the point where the bellyband ends and away from the cutting drum. As shown the transition has a series of walls, including sidewalls, a front wall and a rear wall. The sidewalls of the transition are slanted away from the cutting drum and may be slanted inward and upward so as to ultimately intersect above and forward of the cutting drum. The volume of the space created by the transition is preferably greater than that of the bellyband. Attached to the sidewalls may be a frontal wall 424 and rear wall 422. The frontal wall begins where the bellyband ends and preferably begins at the bottom most point of the cutting drum 418. The frontal wall 424 preferably extends forward and upward on the same plane as the sidewalls, gradually tapering so as to intersect at the same point above and away from the cutting head as the sidewalls. The rear wall 422 is the wall nearest the cutting drum. The rear wall 422 is preferable shaped to conform to the shape of the cutting drum. The rear wall preferably forms an extended void directly after the bellyband. The rear wall 422 is preferably multi-sided, such as two-sided (as shown), circular, three-sided, or more. If the rear wall is two sided and the transition includes a front wall and two side walls, the transition will have at least 5 sides, shown at 438. For example, in accordance with a preferred embodiment, i.e. where the cutting drum is tapered toward the center of the drum, the rear wall may be `v shaped` to create a void conforming to the "v" shaped angle of the cutting head. The rear wall may be formed by a 2-paneled assembly, tapered upward and away from the cutting head to create an entry space with an extended void for chips discharged from the center of the tapered cutting drum to enter. The extended void is ultimately enjoined by the 2 inclined side-walls and tapered forward to ultimately intersect at an imaginary point upward and forward of the cutting drum. The discharge port is preferably provided at a point of 5" to 10" below the intersection point of the side walls and most preferably about 8" or more below the intersecting point of the side, front, and rear walls.

[0063] In practice wood chips are produced at the cutting zone by cutting knives and the anvil. The chips are carried in the space between the bellyband and the cutting drum, and may be carried in ~~one or more pockets 424, 426~~ one or more pockets 425, 426 disposed below each cutting ~~blade 422~~ blade 423, 428. The shape of the bellyband may then act to separate or keep separate the two or more major chip steams to enhance forward directional momentum by reducing chip collisions. The chips exit the space of the

bellyband 410 away from the drum into the transition 416. The extended void 430 of the transition allows chips traveling in the center of the chipper to be efficiently discharged from the bellyband with reduced chip collisions.